ABSTRACT OF THE DISCLOSURE

[0043] A method for depositing metal layers on semiconductor substrates by a thermal chemical vapor deposition (TCVD) process. The TCVD process utilizes high flow rate of a dilute process gas containing a metal-carbonyl precursor to deposit a metal layer. In one embodiment of the invention, the metal-carbonyl precursor can be selected from at least one of $W(CO)_6$, $Ni(CO)_4$, $Mo(CO)_6$, $Co_2(CO)_8$, $Rh_4(CO)_{12}$, $Re_2(CO)_{10}$, $Cr(CO)_6$, and $Ru_3(CO)_{12}$. In another embodiment of the invention, a method is provided for depositing a W layer from a process gas comprising a $W(CO)_6$ precursor at a substrate temperature of about 410° C and a chamber pressure of about 200 mTorr.